United States
Department of
Agriculture

Natural
Resources
Conservation
Service

Washington Basin Outlook Report June 1, 1996

Basin Outlook Reports
and
Federal - State - Private
Cooperative Snow Surveys

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How forecasts are made

Most of the annual streamflow in the Western United States originates as snowfall that has accumulated high in the mountains during winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Predictions are based on careful measurements of snow water equivalent at selected index points. Precipitation, temperature, soil moisture and antecedent streamflow data are combined with snowpack data to prepare runoff forecasts. Streamflow forecasts are coordinated by Natural Resources Conservation Service and National Weather Service hydrologists. This report presents a comprehensive picture of water supply conditions for areas dependent upon surface runoff. It includes selected streamflow forecasts, summarized snowpack and precipitation data, reservoir storage data, and narratives describing current conditions.

Snowpack data are obtained by using a combination of manual and automated SNOTEL measurement methods. Manual readings of snow depth and water equivalent are taken at locations called snow courses on a monthly or semi-monthly schedule during the winter. In addition, snow water equivalent, precipitation and temperature are monitored on a daily basis and transmitted via meteor burst telemetry to central data collection facilities. Both monthly and daily data are used to project snowmelt runoff.

Forecast uncertainty originates from two sources: (1) uncertainty of future hydrologic and climatic conditions, and (2) error in the forecasting procedure. To express the uncertainty in the most probable forecast, four additional forecasts are provided. The actual streamflow can be expected to exceed the most probable forecast 50% of the time. Similarly, the actual streamflow volume can be expected to exceed the 90% forecast volume 90% of the time. The same is true for the 70%, 30%, and 10% forecasts. Generally, the 90% and 70% forecasts reflect drier than normal hydrologic and climatic conditions; the 30% and 10% forecasts reflect wetter than normal conditions. As the forecast season progresses, a greater portion of the future hydrologic and climatic uncertainty will become known and the additional forecasts will move closer to the most probable forecast.

Washington
Water Supply Outlook

June 1996

General Outlook

This is it folks -- the last outlook report of the season. Below normal temperatures and above normal precipitation helped preserve what little snowpack we had left, delaying heavy spring runoff until after the first of June. May streamflows where near to below normal for many parts of the state with only a few going above normal. Near record low temperatures were recorded across the state, and some areas set new records for May average temperatures.

This month I am publishing a considerably condensed version of the report. The basin forecast tables that everyone is used to seeing are still available from the following locations:

Water and Climate Center Homepage **(http://www.wcc.nrcs.usda.gov)**
Anonymous FTP server **(ftp.wcc.nrcs.usda.gov/)**
Oregon/Washington Snow Homepage **(http://www.europa.com/~gillen)**
Centralized Forecasting System Computer by dial-up modem.

If you have trouble finding what you looking for, please call Scott Pattee (509)353-2341.

All in all this has been a very exciting season. Average snowpack in most parts of the state, much above normal precipitation, and major flooding have been the main topics across the state.

Natural resource and emergency management agencies will be spending most of the summer mitigating and repairing flood-ravaged areas throughout the Northwest. It will be a race against time and Mother Nature to finish repair projects before the next flood season arrives.

A lot of this work has already begun. Dike and levee repairs, stream restoration, obstruction removal and revegetation are some of the projects underway while accommodating spring runoff, spawning fish, irrigation season, and regulatory constraints.

Remember, SNOTEL sites collect remote climitological data year-round. There are 45 active SNOTEL sites in Washington collecting and downloading precipitation, temperature and snowpack data on a daily basis. Static reports are updated daily and are available on the above listed Internet and modem connections.

Have a wonderful summer. See you next season.

Streamflow

Eastern Washington forecasts for spring - summer streamflow are for near to above normal. They vary from 138% of average for the Pend Oreille River below Box Canyon to 95% of normal for Bumping Lake inflow. June - September forecasts for many Western Washington streams aren't as good. Cedar River near Cedar Falls, 81%; Green River, 93%; and Skagit River, 102%. Other Washington streams include Mill Creek at Walla Walla, 104%; Wenatchee River at Plain, 104%; Baker River near Concrete, 85%; Elwha River near Port Angeles, 63%; and Colville River, 105%. May streamflows were close to normal throughout the state. The Snake River below Lower Granite Dam was the highest at 124% of normal; and the Skagit River at Concrete, with 67% of normal, was the lowest in the state. Other streamflows were the following percent of normal: Lewis River, 103%; Okanogan River, 111%; Spokane River, 96%; Columbia River at the Canadian border, 94%; and Yakima River at Parker, 79%. Many of the below normal flows can be attributed to the below normal temperatures during May, keeping snowpack in the mountains, not in the streams.

BASIN	MAY STREAMFLOW PERCENT NORMAL	PERCENT OF AVERAGE MOST PROBABLE FORECAST (50% CHANCE OF EXCEEDANCE)
Spokane	96	97
Colville-Pend Oreille	109	105-138
Okanogan-Methow	98	113-131
Wenatchee-Chelan	86	104-124
Yakima	88	95-121
Walla Walla	121	99-104
Cowlitz-Lewis	98	96-121
White-Green-Cedar	Not Available	72-93
North Puget Sound	67	85-104
Olympic Peninsula	Not Available	63-79

Reservoir

Reservoir storage in Washington remained near to above average for June 1. Reservoir storage in the Yakima Basin was 1,029,600 acre feet, 110% of normal. Storage at other reservoirs included Roosevelt at 88% of average, and the Okanogan reservoirs with 127% of normal for June 1. The power generation reservoirs include the following: Coeur d'Alene Lake, 243,500 acre feet, or 87% of normal and 102% of capacity; Chelan Lake, 458,800 acre feet, 102% of average and 68% of capacity; and Ross Lake at 77% of average and 42% of capacity. Many reservoir operators in the state continue to manage for anticipated snowmelt runoff.

BASIN	PERCENT OF CAPACITY	PERCENT OF AVERAGE
Spokane	102	87
Colville-Pend Oreille	42	77
Okanogan-Methow	97	127
Wenatchee-Chelan	68	102
Yakima	97	110
North Puget Sound	74	100

Snowpack

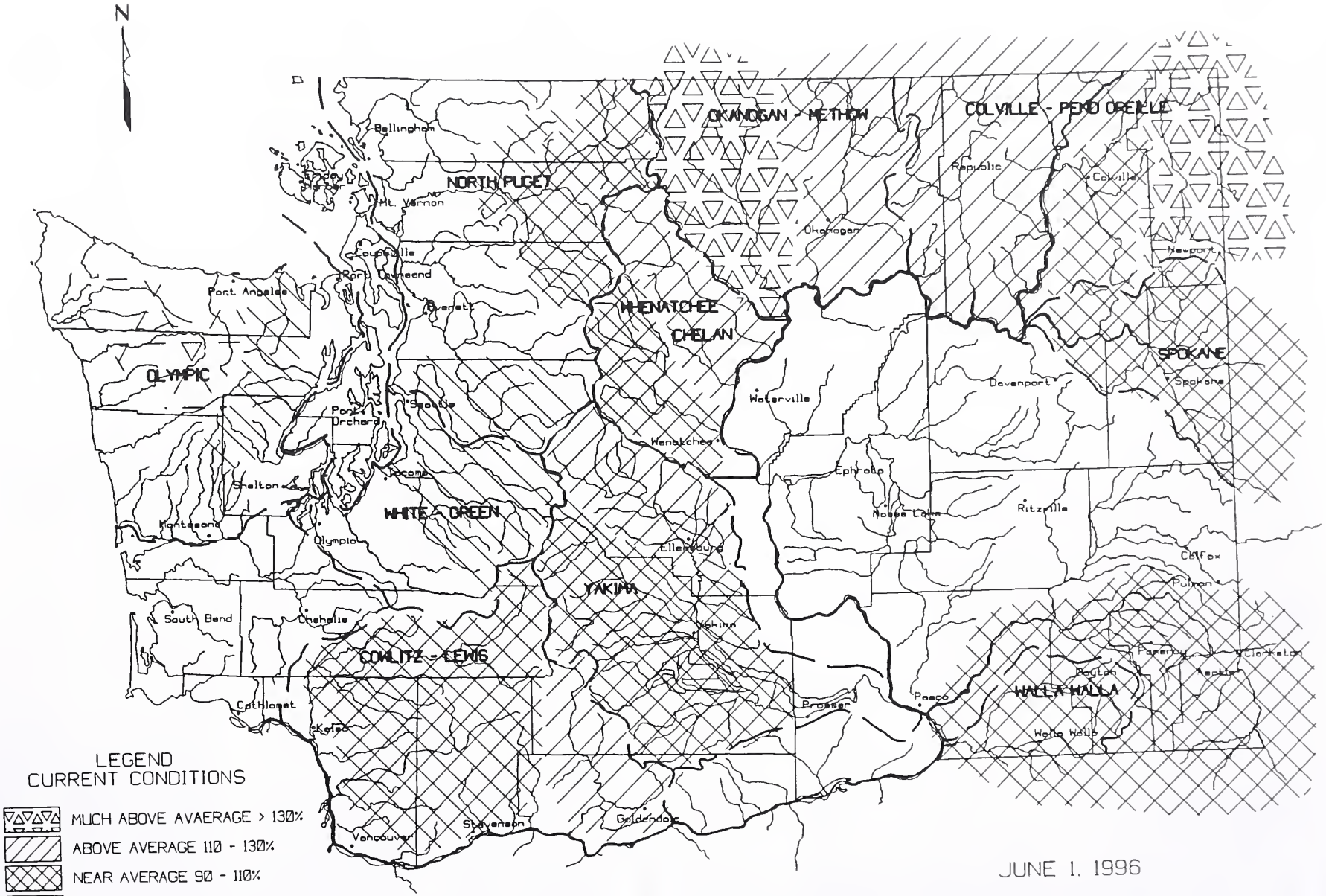
The June 1 statewide SNOTEL reading showed the snowpack at about 120% of normal for sites that have snow remaining. Limited manual snow survey information is collected for June, making it difficult to accurately calculate basin-wide averages. Essentially, snowpack above 5000-foot elevation remains good. Lower elevation snow has melted out. Warmer weather in June has increased meltout considerably at all elevations. If current weather patterns persist, most SNOTEL sites will meltout as normal.

BASIN	PERCENT OF LAST YEAR	PERCENT OF AVERAGE
Spokane	270	91
Colville	Not Reported	Not Reported
Pend Oreille	190	162
Okanogan	196	168
Methow	187	200
Wenatchee	147	132
Chelan	157	172
Yakima	178	116
Walla Walla	Not Reported	Not Reported
Cowlitz	113	108
Lewis	81	90
White	218	178
Green	167	100
North Puget Sound	159	123
Olympic Peninsula	Not Reported	Not Reported

Precipitation

During the month of May the National Weather Service and Natural Resources Conservation Service climate stations showed much above average precipitation accumulation across most of the state. Precipitation varied from a high of 370% of average at White Pass SNOTEL to a low of 46% of normal at Grouse Camp SNOTEL. Basin-wide averages for the water year varied from 178% of normal in the Colville - Pend Oreille River Basins, to 96% of normal in the Walla Walla River Basin. This season's above average precipitation and saturated soils should help sustain near average streamflows for the season. The drawback to these conditions is that we are experiencing higher than normal erosion which leads to increased turbidity and sedimentation in streams and rivers.

	MAY	WATER YEAR
BASIN	PERCENT OF AVERAGE	PERCENT OF AVERAGE
Spokane	133	137
Colville-Pend Oreille	178	132
Okanogan-Methow	136	117
Wenatchee-Chelan	114	141
Yakima	129	154
Walla Walla	96	130
Cowlitz-Lewis	135	148
White-Green-Cedar	130	142
North Puget Sound	141	145
Olympic Peninsula	126	118



JUNE 1, 1996

STREAMFLOW PROSPECTS
WASHINGTON

NTS

U S DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

BASIN SUMMARY OF SNOW COURSE DATA

JUNE 1996

SNOW COURSE		ELEVATION	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE 1961-90
PEND OREILLE RIVER							
BENTON MEADOW		2370	6/01/96	0	.0	--	--
BENTON SPRING		4920	6/01/96	0	.0	--	--
BUNCHGRASS MDW	PILLOW	5000	6/01/96	---	.0	4.6	15.4
LOOKOUT	PILLOW	5140	6/01/96	---	10.5	.0	10.0
KETTLE RIVER							
BIG WHITE MTN	CAN.	5510	5/31/96	43	17.2	5.8	8.9
COLVILLE RIVER							
OMAK LAKE, TWIN LAKES							
MOSES MTN	PILLOW	4800	6/01/96	---	.0S	.0	.0
SPOKANE RIVER							
LOST LAKE	(d)	6110	6/01/96	---	47.1E	24.1	41.6
MOSQUITO RDG	PILLOW	5200	6/01/96	---	19.5	2.5	16.0
SUNSET	PILLOW	5540	6/01/96	---	15.5	.6	20.7
LOOKOUT	PILLOW	5140	6/01/96	---	10.5	.0	10.0
NEWMAN LAKE							
QUARTZ PEAK	PILLOW	4700	6/01/96	---	.0	.0	.0
OKANOGAN RIVER							
BLACKWALL PEAK	CAN.	6370	6/01/96	---	33.1	--	26.2
ENDERBY	CAN.	6200	5/31/96	116	50.4	26.8	39.0
ESPERON CK. UP	CAN.	5410	6/01/96	14	5.7	.0	5.1
ESPERON CK. MID	CAN.	4690	6/01/96	2	.6	.0	.8
FREEZEOUT CK. TRAIL		3500	5/31/96	0	.0	.0	--
GREYBACK RES	CAN.	5120	5/30/96	8	1.7	--	.8
HAMILTON HILL	CAN.	4890	6/02/96	1	.2	--	1.3
HARTS PASS		6500	5/30/96	94	44.0	33.9	--
HARTS PASS	PILLOW	6500	6/01/96	---	50.5S	27.0	25.3
ISINTOK LAKE	CAN.	5500	5/28/96	1	.4	.0	1.2
LOST HORSE MTN	CAN.	6300	5/31/96	36	13.0	1.4	4.0
MISSEZULA MTN	CAN.	5090	6/02/96	0	.0	--	--
MISSION CREEK	CAN.	5800	6/01/96	---	18.7	--	13.6
MT. KOBAU	CAN.	5900	5/30/96	27	11.2	10.9	5.0
SALMON MDWS	PILLOW	4500	6/01/96	---	.0S	.0	.0
SILVER STAR MTN	CAN.	6000	6/02/96	69	33.1	21.7	16.9
WHITE ROCKS MTN	CAN.	6000	5/31/96	33	14.5	3.7	9.3
METHOW RIVER							
HARTS PASS		6500	5/30/96	94	44.0	33.9	--
HARTS PASS	PILLOW	6500	6/01/96	---	50.5S	27.0	25.3
SALMON MDWS	PILLOW	4500	6/01/96	---	.0S	.0	.0
CHELAN LAKE BASIN							
LYMAN LAKE	PILLOW	5900	6/01/96	---	73.0S	54.1	43.3
MINERS RIDGE	PILLOW	6200	6/01/96	---	51.9S	31.1	38.1
PARK CK RIDGE	PILLOW	4600	6/01/96	---	22.1S	6.2	5.2
RAINY PASS		4780	5/30/96	57	25.0	2.0	--
RAINY PASS	PILLOW	4780	6/01/96	---	36.8S	25.8	20.4
ENTIAT RIVER							
POPE RIDGE	PILLOW	3540	6/01/96	---	.0S	.0	.0
WENATCHEE RIVER							
BLEWETT PASS#2	PILLOW	4270	6/01/96	---	.0S	.0	.0
FISH LAKE	PILLOW	3370	6/01/96	---	1.6S	.0	5.0
LYMAN LAKE	PILLOW	5900	6/01/96	---	73.0S	54.1	43.3
STEVENS PASS	PILLOW	4070	6/01/96	---	4.7S	.0	5.7
TROUGH #2	PILLOW	5310	6/01/96	---	.0S	.0	6.0
UPPER WHEELER	PILLOW	4400	6/01/96	---	.0S	.0	.0
SQUILCHUCK CREEK		NO REPORT					
STEMILT CREEK		NO REPORT					
UPPER WHEELER	PILLOW	4400	6/01/96	---	.0S	.0	.0
COLOCKUM CREEK							
TROUGH #2	PILLOW	5310	6/01/96	---	.0S	.0	6.0
YAKIMA RIVER							
BLEWETT PASS#2	PILLOW	4270	6/01/96	---	.0S	.0	.0
BUMPING RIDGE	PILLOW	4600	6/01/96	---	5.7S	.0	6.3
CORRAL PASS	PILLOW	6000	6/01/96	---	28.8S	20.9	19.6
FISH LAKE		3370	5/29/96	0	.0	--	--
FISH LAKE	PILLOW	3370	6/01/96	---	1.6S	.0	5.0
GREEN LAKE	PILLOW	6000	6/01/96	---	6.7S	11.5	3.8
GROUSE CAMP	PILLOW	5380	6/01/96	---	.0S	.0	.0
LOST HORSE	PILLOW	5000	6/01/96	---	.0S	.0	.0
MORSE LAKE	PILLOW	5400	6/01/96	---	44.1S	12.6	21.4
OLALLIE MDWS	PILLOW	3960	6/01/96	---	20.3S	14.2	30.0
SASSE RIDGE	PILLOW	4200	6/01/96	---	.4S	.4	1.3
STAMPEDE PASS	PILLOW	3860	6/01/96	---	15.0S	9.0	15.0
WHITE PASS ES	PILLOW	4500	6/01/96	---	1.3S	1.2	4.6
AHTANUM CREEK							
GREEN LAKE	PILLOW	6000	6/01/96	---	6.7S	11.5	3.8
LOST HORSE	PILLOW	5000	6/01/96	---	.0S	.0	.0
MILL CREEK							
HIGH RIDGE	PILLOW	4980	6/01/96	---	.0S	.0	.6
TOUCHET #2	PILLOW	5530	6/01/96	---	.0	.0	--
LEWIS - COWLITZ RIVERS							
JUNE LAKE	PILLOW	3200	6/01/96	---	.0S	.0	.0
LONE PINE	PILLOW	3800	6/01/96	---	5.8S	9.3	9.4
PARADISE PARK	PILLOW	5500	6/01/96	---	63.6S	61.7	48.1
PIGTAIL PEAK	PILLOW	5900	6/01/96	---	46.4S	35.3	37.5
POTATO HILL	PILLOW	4500	6/01/96	---	.0S	.0	1.1
SHEEP CANYON	PILLOW	4050	6/01/96	---	.0S	.0	11.6
SPENCER MDW	PILLOW	3400	6/01/96	---	.0S	.0	.0
SPIRIT LAKE	PILLOW	3100	6/01/96	---	.0S	.0	.0
SURPRISE LKS	PILLOW	4250	6/01/96	---	15.6S	17.0	14.5
WHITE PASS ES	PILLOW	4500	6/01/96	---	1.3S	1.2	4.6
WHITE RIVER							
CORRAL PASS	PILLOW	6000	6/01/96	---	28.8S	20.9	19.6
MORSE LAKE	PILLOW	5400	6/01/96	---	44.1S	12.6	21.4
GREEN RIVER							
COUGAR MTN.	PILLOW	3200	6/01/96	---	.0S	.0	.0
STAMPEDE PASS	PILLOW	3860	6/01/96	---	15.0S	9.0	15.0
CEDAR RIVER							
MT. GARDNER	PILLOW	2860	6/01/96	---	.0S	.0	.0
TINKHAM CREEK	PILLOW	3000	6/01/96	---	.0S	.0	.0
MEADOWS PASS	PILLOW	3240	6/01/96	---	.0S	.0	.0
SNOQUALMIE RIVER							
OLALLIE MDWS	PILLOW	3960	6/01/96	---	20.3S	14.2	30.0
SKYKOMISH RIVER							
STAMPEDE PASS	PILLOW	3860	6/01/96	---	15.0S	9.0	15.0
STEVENS PASS	PILLOW	4070	6/01/96	---	4.7S	.0	5.7
SKAGIT RIVER							
BEAVER CREEK TRAIL		2200	5/31/96	0	.0	.0	--
BEAVER PASS		3680	5/30/96	11	5.2	10.7	--
BROWN TOP	AM	6000	5/30/96	115	54.2	43.6	--
DEVILS PARK		5900	5/30/96	86	40.6	33.6	31.8
FREEZEOUT CK. TRAIL		3500	5/31/96	0	.0	.0	--
HARTS PASS		6500	5/30/96	94	44.0	33.9	--
HARTS PASS	PILLOW	6500	6/01/96	---	50.5S	27.0	25.3
LYMAN LAKE	PILLOW	5900	6/01/96	---	73.0S	54.1	43.3
MEADOWS CABIN		1900	5/31/96	0	.0	.0	--
NEW HOZOMEEN LAKE		2800	5/31/96	0	.0	.0	--
RAINY PASS		4780	5/30/96	57	25.0	2.0	--
RAINY PASS	PILLOW	4780	6/01/96	---	36.8S	25.8	20.4
THUNDER BASIN		4200	5/31/96	14	5.6	3.8	--
THUNDER BASIN	PILLOW	4200	6/01/96	---	11.5S	4.9	6.0
BAKER RIVER		NO REPORT					
ELWHA RIVER		NO REPORT					
MORSE CREEK		NO REPORT					
DUNGENESS RIVER		NO REPORT					
QUILCENE RIVER		NO REPORT					
MOUNT CRAG	PILLOW	4050	6/01/96	---	4.5S	10.7	.0
WYNOOCHEE RIVER		NO REPORT					

(d) Denotes discontinued site.

SNOW SURVEY JOINS WORLD WIDE WEB

NATURAL RESOURCES CONSERVATION SERVICE

Snow Survey and Water Supply Forecasting products are now available on the INTERNET. A few of our more popular (SNOTEL Update Reports, State Basin Outlook Reports, historic SNOTEL data, and products previously published in the Water Supply Outlook Report for the Western United States) are now available via our new Home Pages and our Anonymous FTP server.

The Universal Resource Locator (URL) for the Water Climate Center home page is:

http://www.wcc.nrcs.usda.gov/

The Universal Resource Locator (URL) for the Oregon/Washington Snow Survey home page is:

http://www.europa.com/~gillen

The address for the WCC Anonymous FTP server is:

ftp.wcc.nrcs.usda.gov

You can access the Anonymous FTP server using your INTERNET browser (Netscape, Mosaic, etc.) by changing the URL to:

ftp://ftp.wcc.nrcs.usda.gov/

We will continue to add more products and abilities to the Home Pages and Anonymous FTP server and welcome any comments and suggestions you might have.

Questions and comments should be directed to the NRCS Snow Survey and Water Supply Forecasting contact in your state or in Portland:

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The Following Organizations Cooperate With the Natural Resources Conservation Service in Snow Survey Work*:

Canada	Ministry of the Environment Investigations Branch, Victoria, British Columbia
State	Washington State Department of Ecology Washington State Department of Natural Resources
Federal	Department of the Army Corps of Engineers U.S. Department of Agriculture Forest Service U.S. Department of Commerce NOAA, National Weather Service U.S. Department of Interior Bonneville Power Administration Bureau of Reclamation Geological Survey National Park Service Bureau of Indian Affairs
Local	City of Tacoma City of Seattle Chelan County P.U.D. Pacific Power and Light Company Puget Sound Power and Light Company Washington Water Power Company Snohomish County P.U.D. Colville Confederated Tribes Spokane County Yakama Indian Nation
Private	Okanogan Irrigation District Wenatchee Heights Irrigation District Newman Lake Homeowners Association

***Other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.**

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